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INSTRUCTIONS FOR

DECADE AMPLIFIER

MODEL 220A

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JULY, 1951

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BALLANTINE LABORATORIES, INC.
BOONTON, NEW JERSEY

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SPECIFICATIONS

BALLANTINE MODEL 220A DECADE AMPLIFIER

Frequency Range

10—150,000 c.p.s.

Voltage Amplification

10 times or 100 times (20 or 40 DB).
Maximum input voltage 50 millivolts for either gain.

Accuracy of Amplification

2% over entire frequency range.

Input Impedance

5 megohms shunted by a capacitance of 15 mmfds.

Output Impedance

Less than 900 ohms in series with 2 mfds. for 10 times gain.
Less than 7000 ohms in series with 2 mfds. for 100 times gain.

Tubes

Two 1U4. Tubes are supplied.

Batteries

Two Eveready Type 742; two Eveready Type 467. Batteries are supplied.

Dimensions

4½" high, 5¾" wide, 8¾" long

Weight

7¾ pounds

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INSTRUCTIONS FOR

MODEL 220A DECADE AMPLIFIER

GENERAL — This instrument provides stable voltage gains of exactly 10 or 100 times over a frequency range extending from 10 to 150,000 cycles. It is operated by self-contained batteries having a life of over 150 hours. Either the 10 times gain or the 100 times gain may be selected by means of a switch. Two stages of amplification are employed with sufficient negative feedback to insure that normal variation of battery voltages, changes in tubes and other circuit parameters do not affect the gain by more than 2 per cent.

While the Decade Amplifier was designed primarily for use with the Model 300 Voltmeter it may be used within the limits of its frequency response of 10 to 150,000 cycles with other Ballantine Voltmeters or for other applications when stable voltage gains of 10 or 100 are desired.

When used with the Model 300 Voltmeter, AC voltages down to 0.1 millivolt may be measured with the 10 times gain. Theoretically, with the 100 times gain, voltages down to 0.01 millivolt (10 microvolts) should be measurable, but as a practical matter the random noise level for the frequency range covered is such as to make the measurement of voltages as low as 10 microvolts somewhat unreliable. However, reliable readings may be obtained down to 20 microvolts with an error not exceeding plus 10 per cent.

BATTERIES AND TUBES — Two Type 1U4 tubes are used. Each tube is operated from a separate 1½ volt "A" battery — Eveready No. 742 or equivalent. The 135 volt "B" battery supply is obtained from two 67½ volt batteries connected in series — Eveready Minimax No. 467 or equivalent. The "A" batteries should be replaced when their voltage drops below 1.15 volts on load and the "B" battery should be replaced when the voltage drops below 108 volts on load when measured on a meter having a resistance of at least 10,000 ohms per volt.

A meter is provided on the panel to indicate the condition of the batteries. The meter will read the voltage of one "A" battery when the ON-OFF switch is on the ON position. The condition of the "B" battery may be ascertained by pressing the button (immediately below the meter) marked "Press for B Batt. Test".

If the pointer of the meter reads to the left of that portion of the scale marked in red the voltage of the battery being tested is too low for satisfactory operation and the battery should be replaced. Both "A" batteries should be replaced at the same time.

It is recommended that depleted batteries not be allowed to remain in the case because of the possibility that they may swell and become difficult to remove.

OPERATION — The instrument is ready to operate as received and is turned on by pulling out the switch located to the left of the meter. The gain is selected by means of the switch to the right of the meter.

In order to guard against the introduction of spurious voltages the input terminal marked GND should be grounded. However, the amplifier may be used in networks where it is not permissible to ground the GND terminal provided the small capacitance of the amplifier case to ground or to surrounding objects introduces neither appreciable loading on the network nor detectable spurious voltages in the network from external A.C. fields. Whenever the amplifier is used without a ground, the possible grounding effect of whatever load is connected to its output terminals on an ungrounded or balanced to ground network working into its input terminals must be considered because the output terminal of the amplifier marked GND is directly connected to the input terminal marked GND.

INPUT AND OUTPUT IMPEDANCES — The input impedance corresponds to a resistance of 5 megohms shunted by a capacitance of 15 mmfds.

The output impedance corresponds to a resistance of less than 900 ohms in series with 2 mfds. for the 10 times gain and to a resistance of less than 7,000 ohms in series with 2 mfds. for the 100 times gain. If the output of the Decade Amplifier is fed to loads having a different shunt capacitance (30 mmfds.) or a lower shunt resistance (½ megohm) than the Model 300 Voltmeter, its gain may vary more than 2% at the extreme ends of its frequency range.

GAIN ADJUSTMENT — The amplifier gain is carefully adjusted before the instrument leaves the factory. In case, however, this adjustment is accidentally disturbed a screw-driver gain adjustment is provided whereby the proper setting may be restored. This adjustment may be checked by means of an accurately calibrated 10 to 1 potential divider

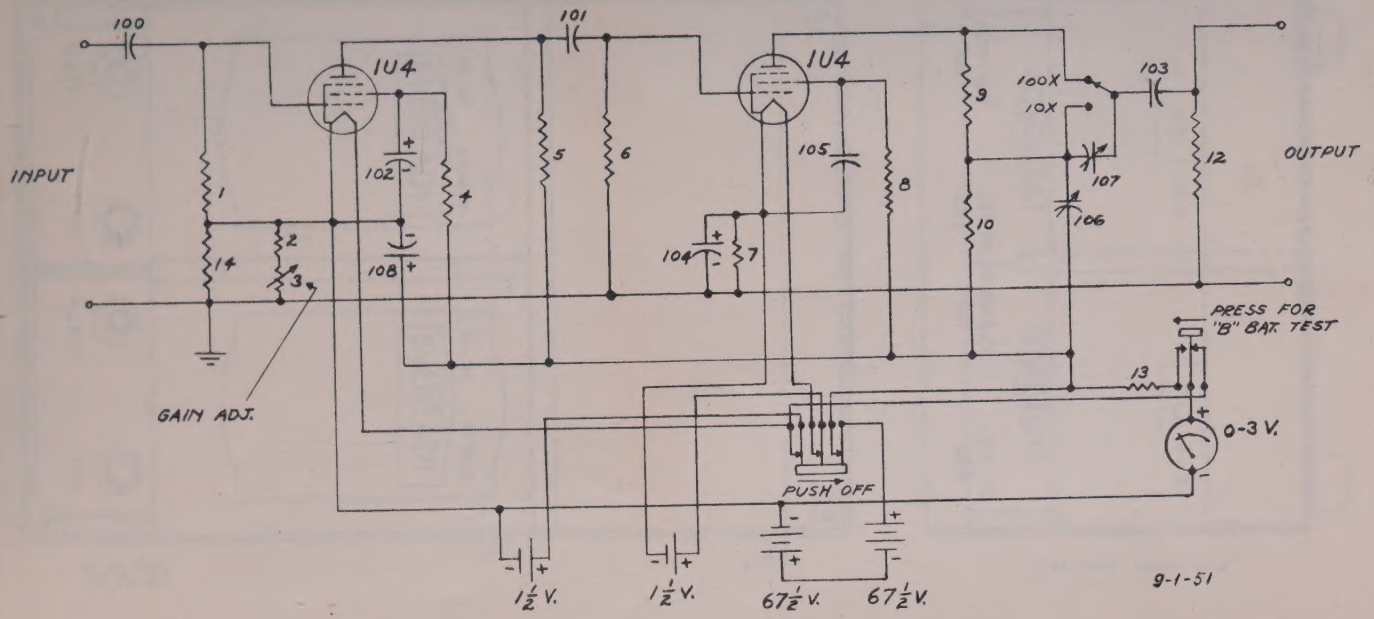
or by means of a suitably accurate electronic voltmeter, such as the Ballantine Model 300. If the gain adjustment is made at any convenient frequency in the range from 200 cycles to 100,000 cycles, the gain of the amplifier will be uniform within 2% over its entire frequency range for either the 10 times or the 100 times setting of the gain selector switch.

OVERLOAD CHARACTERISTICS — For maximum accuracy over the entire frequency range, voltages in excess of 50 millivolts should not be impressed across the input terminals of the amplifier. This corresponds to an output voltage of ½ volt on the 10 times range and 5 volts on the 100 times range.

SHIELDING — When using the extreme sensitivity of the amplifier, and especially when measurements are being made on high impedance circuits, it may be necessary to shield the high potential input terminal from extraneous fields.

SERVICING — If trouble develops in the amplifier the condition of the batteries should first be checked. If the batteries are in good condition and there is no evidence of noise or bad connections the tubes should be changed. If this does not clear up the trouble the instrument should be returned to us for inspection and repair. DO NOT RETURN THE INSTRUMENT, HOWEVER, WITHOUT FIRST WRITING TO EXPLAIN THE TROUBLE.

DECADE AMPLIFIER
MODEL 220A



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